

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
16 September 2004 (16.09.2004)

PCT

(10) International Publication Number  
**WO 2004/078218 A2**

(51) International Patent Classification<sup>7</sup>: **A61L**

(21) International Application Number:  
PCT/IL2004/000155

(22) International Filing Date: 19 February 2004 (19.02.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
154814 9 March 2003 (09.03.2003) IL

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant and  
(72) Inventor: SHIFRIN, Edward, G. [IL/IL]; 64, Ha-Shahar St., 43565 Raanana (IL).

(72) Inventors: NICKELSHPUR, Gennady, S.; 9-D Ha-Bastiliya St., Apt. 9, 35597 Haifa (IL). SHVARTSMAN, D., Mordehy; 3, Harav Mashash St., Apt. 1, 32167 Haifa (IL). UMANSKY, A., Mark; 20, Mordehy Anilevitch St., Apt. 8, 35025 Haifa (IL).

**Declaration under Rule 4.17:**

— *of inventorship (Rule 4.17(iv)) for US only*

**Published:**

— *without international search report and to be republished upon receipt of that report*

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: STERNAL CLOSURE SYSTEM, METHOD AND APPARATUS THEREFOR

(57) Abstract: The present invention relates generally to surgical devices, and more particularly to devices and methods for reapproximating the sternal halves or sides of a patient's severed or separated sternum following a partial or medial sternotomy. There is proposed a system of devices and apparatus for fast connection of sternum halves. The system comprises several pairs of anchor means, substantially screws, with external thread of one or different directions and an inner axial passage, as well as staples for rigid, tight connection of these anchor means. The anchor means and staples are made from materials allowed by FDI. Substantially metals and alloys of a group containing stainless steel, titanium, tantalum and alloys of titanium, tantalum, or from biodegradable material. There are proposed apparatus for simultaneous pairwise placing of anchor means and apparatus for placing or removing staples. There is further proposed a method for applying the devices and apparatus of this system in performing surgical procedures within thoracic cavity.

WO 2004/078218 A2

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
16 September 2004 (16.09.2004)

PCT

(10) International Publication Number  
**WO 2004/078218 A3**

(51) International Patent Classification<sup>7</sup>: **A61B 17/56**

(21) International Application Number:  
PCT/IL2004/000155

(22) International Filing Date: 19 February 2004 (19.02.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
154814 9 March 2003 (09.03.2003) IL

(71) Applicant and

(72) Inventor: SHIFRIN, Edward, G. [IL/IL]; 64, Ha-Shahar  
St., 43565 Raanana (IL).

(72) Inventors: NICKELSHPUR, Gennady, S.; 9-D  
Ha-Bastiliya St., Apt. 9, 35597 Haifa (IL). SHVARTS-  
MAN, D., Mordehy; 3, Harav Mashash St., Apt. 1,  
32167 Haifa (IL). UMANSKY, A., Mark; 20, Mordehy  
Anilevitch St., Apt. 8, 35025 Haifa (IL).

(81) Designated States (*unless otherwise indicated, for every  
kind of national protection available*): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,

CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(84) Designated States (*unless otherwise indicated, for every  
kind of regional protection available*): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-  
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,  
GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,  
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

— *of inventorship (Rule 4.17(iv)) for US only*

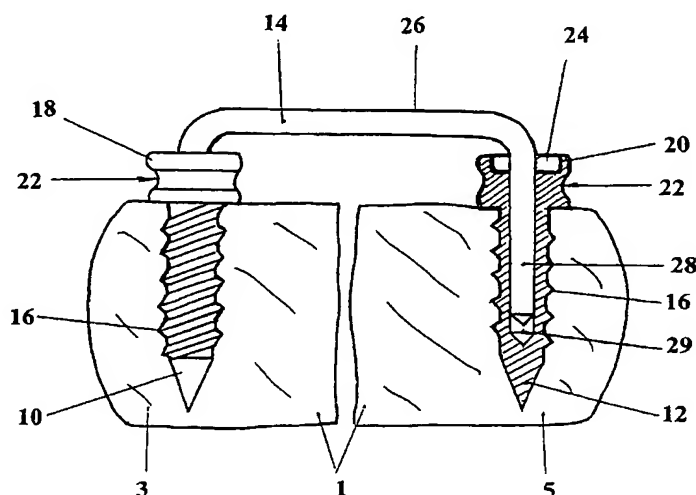
**Published:**

— *with international search report*

— *before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments*

[Continued on next page]

(54) Title: STERNAL CLOSURE SYSTEM, METHOD AND APPARATUS THEREFOR



(57) Abstract: The present invention relates generally to surgical devices, and more particularly to devices and methods for reapproximating the sternal halves (3,5) or sides of a patient's severed or separated sternum following a partial or medial sternotomy. There is proposed a system of devices and apparatus for fast connection of sternum halves. The system comprises several pairs of anchor means (10,12), substantially screws, with external thread of one or different directions and an inner axial passage, as well as staples (14) for rigid, tight connection of these anchor means (10,12). The anchor means (10,12) and staples (14) are made from materials allowed by FDI, substantially metals and alloys of a group containing stainless steel, titanium, tantalum and alloys of titanium, tantalum, or from biodegradable material. There are proposed apparatus (54,120,150) for simultaneous pairwise placing of anchor means and apparatus for placing or removing staples. There is further proposed a method for applying the devices and apparatus of this system in performing surgical procedures within thoracic cavity.

WO 2004/078218 A3



---

**(88) Date of publication of the international search report:**  
28 October 2004

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*